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(71) Applicant (for all designated States except US): TOGA SYSTEM AB [SE/SE]; Odengatan 90, S-113 22 Stockholm (SE).

(72) Inventor; and

(75) Inventor/Applicant (for US only) : ERIKSSON, Gösta [SE/SE]; Ronnebygatan 31, S-292 00 Karlshamn (SE).

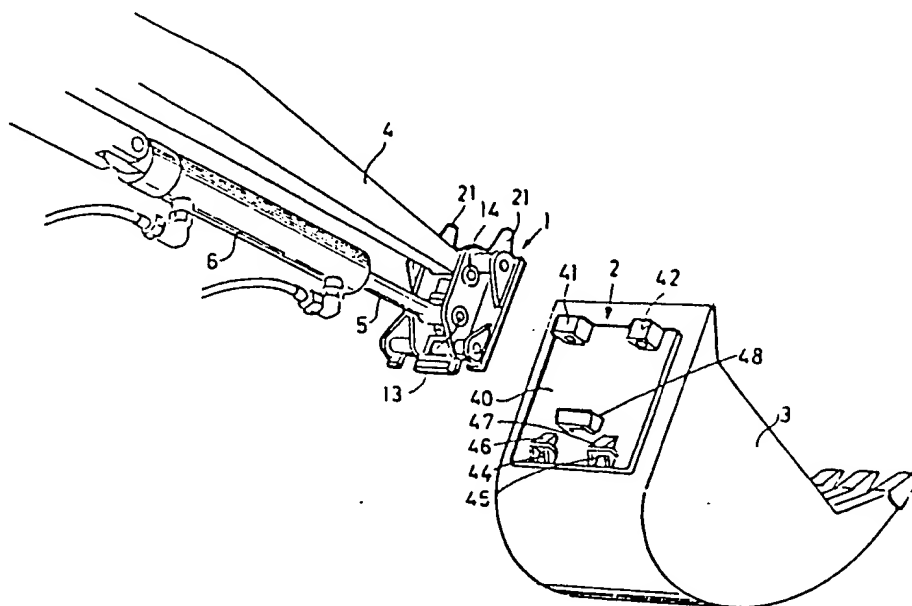
(74) Agents: BJELLMAN, Lennart; Dr Ludwig Brann Patentbyrå AB, Drottninggatan 7, Box 1344, S-751 43 Uppsala (SE) et al.

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(54) Title: QUICK-ACTION ATTACHMENT DEVICE



(57) Abstract

A quick-acting attachment device, a so-called quick-attachment, for releasable mounting of working tools (3) to the end of an operating arm (4). In the device there are included at least one guiding block (44, 45), at least one lug (41, 42) and at least one locking block (48) for permanent securing to the working tool (3), and an element (1) including at least one tapered pin (21) for receiving in the lug or lugs (41, 42) on the working tool (3), at least one guiding (22, 23) for co-operation with the guiding block or blocks (44, 45) and at least one locking head (28) for engagement with the locking block or blocks (48). The tapered pin or pins (21) are pivotable in a plane which is normal to the plane in which the elements are mounted.

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Quick-Action Attachment Device

The present invention relates to devices for attaching of working tools to operating arms of excavators and other working machines, and more closely to such a device embodied as what is called a quick-attachment.

5

The invention is based on the fact that there is no simple, cheap and reliable device for quick and safe attaching of digging buckets, lifting buckets and other tools to the end of operating arms, such as to the outermost beam-portion of an excavator, such a beam portion being designated the stick. Today, there are nearly exclusively used pins or shafts for such an attachment which for each exchange of tool have to be passed through openings being in alignment of matching elements on the stick as well as on the bucket. The fitting-in  
10 difficulties in connection with this conventional attachment, having regard to exchange of bucket or other tools, are great and well known as well as other problems which are connected thereto.

20 When carrying out this conventional attachment it is practically impossible for one man alone successfully to tackle the attachment of the elements and for the man who during the machine driver's operating of the arm, is trying to pass the pins or shafts through their openings, there is a great risk  
25 that he might be hurt.

The quick-attachment in accordance with the present invention is as useful for attachment of such tools as loading buckets, forks and similar as well as digging buckets of different  
30 types to operating arms.

With regard to the fact that the operating time of working machines is very expensive it is to be desired that the machine should be possible to use so rationally as possible

with shortest possible downtime. It is also to be desired that a machine is so versatile as possible due to which fact it is common that there is a set of different tools for different working operations belonging to each machine. While it previously was common to make use of special machines which could carry out only one type of work it has now, indeed, more and more been a change to exchange of working tools of one and the same machine.

10 There are already some quick-attachments for said use. However, they have all the common feature that they have not been in any greater use. The reasons therefore might be several but the most common ones are most likely the fact that they are not so easy to use as expected of a quick-attachment and they do not compensate for wearing but the attachment is getting loose. Many of them give, for the rest, already from the beginning a loose attachment as they structurally are based upon the opinion that there is to be a play between the elements included in the attachment. Some of them are also so heavy that they affect the loading capacity of the bucket and sometimes they also add to the length of the arm to such an extent that the balance of the machine is affected. When officially examining a machine having such a quick-attachment there is, accordingly, a risk that the loading capacity of the machine is reduced which in practice working means that the working capacity of the machine is reduced.

It is great forces that are to be transferred to the working tool in connection with e.g. ground works. If there is a slight play in the transmission to the bucket then strokes appear and such strokes damage both machine and working tool. If the play is getting too great then it is impossible to manipulate the working tool with necessary precision. There is also a risk for such damages of the elements of the quick-attachment that there are great difficulties to release the attachment, and exchange of working tools cannot be carried

out without repair of the elements of the quick-attachment.

The object of the present invention is to remove the above problems. This object is reached by a quick-action attachment  
5 device of the type referred to in the claims. Also the particularly characterizing features of the invention are clear from the claims.

The invention is closer described in the following with  
10 reference to the attached drawings; in which

FIG. 1 schematically shows the two main elements of the quick-attachment in accordance with the invention mounted on a digging bucket as well as on the end of an excavator arm,

15

FIG. 2 is a partially sectional elevational view of the element of the quick-attachment fixed to the machine arm,

FIG. 3 is a schematical sectional view along line III-III in  
20 Fig. 2,

FIG. 4 is a partially sectional elevational view of the element of the quick-attachment fixed to the bucket,

25 FIG. 5 is a schematical sectional view along line V-V in Fig. 2, and

FIG. 6 is a view similar to Fig. 1 but showing an alternative embodiment of the quick-attachment.

30

The quick-attachment in accordance with the invention shown in the drawings and described in the following includes plates on which the different parts included in the quick-attachment are mounted. At least the parts intended to be secured to the  
35 bucket itself may, however, be secured directly to the bucket without any intermediate plate in which case the wall of the

bucket constitutes the base for these details.

The embodiment of the quick-attachment in accordance with the invention shown in Figs. 1 to 5 comprises an end element 1 secured to the end of an excavator beam 4 and to a rod 5 from a hydraulic cylinder 6 for operating the digging bucket 3 attached to the beam, and a tool element 2 secured to the digging bucket 3.

From Figs. 2 and 3 it is clear in more detail how the end element 1 is constructed. Hence, it comprises a rectangular plate 10 from which two parallel webs 11, 12 extend perpendicular. These are of a length substantially corresponding to the length of the plate 10 and they are arranged symmetrically, i.e. in such a way that they are parallel to and on the same distance from each long side of the plate 10. Between these webs 11, 12 there are extended two shafts 13, 14 which, in the shown embodiment, are journalled in said webs 11, 12 and which are intended to be used for the securing to the excavator beam 4 as well as to the rod 5.

Shafts 13 and 14 are located a distance inwards from the ends of the webs 11, 12 and rather close to the free end edges of the webs. Closer to the plate 10 and outside the shaft 14 there are trunnions 15, 16 mounted to the webs 11, 12 and extended from the webs towards the long sides of the plate 10 where each trunnion 15, 16 is fixed in a lug 17, 18. A guiding member 19, 20 is pivotably journalled onto each trunnion 15, 16. The guiding members 19, 20 include on one hand a journalling portion through which the trunnion 15, 16 extends and on the other hand a tapered pin 21 extending therefrom and being in the shape of a truncated cone the base of which is located in the journalling portion. Hence, the guiding members 19, 20 with their tapered pins 21 can be pivoted from one position in which they are pointing inclining downwardly towards the plate 10 to a position in which they point

inclining upwards and outwards from the plate 10.

At the ends of the webs 11, 12 opposite the guiding members 19, 20 there are guide pins 22, 23 secured thereto and  
5 extending towards the long sides of the plate 10 where they are mounted in lugs 24, 25 in the same way as the trunnions 15, 16. Between the webs 11, 12 and the lugs 17, 18, 24, 25 pieces 9 are cut away from the plate 10 from its short sides and in under the guiding pins 22, 23 and the guiding members  
10 19, 20 respectively.

In the area between the webs 11, 12 and outside shaft 13 there is a rectangular opening 26 through the plate 10 and between said opening 26 and the shaft 14 there is a hydraulic cylinder  
15 27 with a wedge-shaped locking head 28 which can be moved out over the opening 26. Although hydraulic operation of the locking head 28 is to prefer, it can, however, be operated in some other way, e.g. by the aid of an electrical device or even by hand by the aid of a screw or toggle mechanism or the  
20 like.

The element of the quick-attachment in accordance with the invention, the tool element 2, shown in Figs. 4 and 5, includes a rectangular plate 40 which is intended to be  
25 mounted to a working tool by welding, screwing or the like. At one short side of this plate 40 there are two lugs 41, 42 fixed which are open in the longitudinal direction of the plate 40 and in which there are through-bores 43 having the same tapered shape as the one of the tapered pins 21 and the  
30 base faced inwards towards the plate 40.

At the short side of the plate 40 opposite to the lugs 41, 42 there is a pair of guiding blocks 44, 45 having an inclined guiding plane 46, 47 each sloping downwards and inwards  
35 towards the plate 40. A locking block 48 having an opening 49 extended therethrough in the longitudinal direction of the

plate 40 and of a wedge-shape corresponding to that of the locking head 28 is arranged about intermediate the guiding planes 46, 47.

- 5 The structure in accordance with the invention operates in the following way:

When a bucket 3 is to be connected to, i.e. is to be coupled to the beam of an excavator, the excavator driver turns the arm 4 out over the bucket 3 which then is in the resting position shown in Fig. 1. From the driver's seat the driver can see the lugs 41, 42 and he manipulates the arm forwards as shown in Fig. 1 in which position he also can see the tapered pins 21. In this position the tapered pins 21 point outwards from the plate 10 so that during the continued manipulation the pins 21 are guided towards the lugs 41, 42 and into the bores 43. The pins 21 are then adjusted into matching position in relation to the bores 43 while the plate 10 is angularly positioned outwards from the plate 40 at the end opposite to the pins 21.

As soon as the tapered pin 21 have entered the bores 43 in the lugs 41, 42 the driver can continue to turn the beam 4 upwards and the bucket 3 is then lifted in the back and is rolled towards the teeth. The plates 10 and 40 are then brought closer to each other and the locking block 48 is coming up through the hole 26 in the plate 10 simultaneously as the guiding pins 22, 23 slide along the guiding surfaces 46, 47 on the guiding blocks 44, 45. In order to reduce the friction the guiding pins 22, 23 may be journalled for rotation so that they instead of sliding roll along the guiding surfaces 46, 47.

The distance between the lugs 41, 42 and the guiding blocks 44, 45 in relation to the guiding members 19, 20 and the guiding pins 22, 23 is such that when the tapered pins 21 are



in place within the lugs 41, 42 the guiding pins 22, 23 can slide only a distance along the guiding surfaces 46, 47 before the clamp forces start to act. Accordingly, the plates 10 and 40 are not allowed to get into contact with each other. During  
5 the use of the quick-attachment the different contact surfaces are of course worn and the plates 10 and 40 are getting closer and closer and when the wearing has been so great that the plates 10 and 40 really are in contact with each other then it is time for adjustment or reconditioning of the quick-  
10 attachment.

For the locking the wedge-shaped locking head 28 is used which, when the two elements 1 and 2 of the quick-attachment have been moved together as much as possible by the  
15 manipulation of the driver, is brought into the opening 49 of the locking block 48. The locking head 28 is kept under bias in hydraulic or mechanical way, e.g. by the aid of a compression spring so that it in the locking position tends to move further and further into the opening 49. In connection with  
20 the work of the machine the two elements 1 and 2 of the quick-attachment are of course moved a little in relation to each other and every little play then appearing is compensated by the locking head 28.

25 The cooperation between the sloping surfaces 46, 47 and the guiding pins 22, 23 gives rise to the fact that the end element 1 is clamped between the lugs 41, 42 and the guiding blocks 44, 45 and the wedge-shaped locking head 28 in cooperation with the locking block 48 maintains this clamping action.  
30 The direct force between the bucket 3 and the arm 4 is transferred through the locking block 48 and the locking head 28 but this force is balanced by the other four contact points 19, 20 and 41, 42 as well as 22, 23 and 44, 45 respectively.

35 All parts subjected to wearing are easily interchangeable due to which fact a reconditioning of the quick-attachment in

accordance with the invention is rapid and cheap to carry out.

For adjustment of the clamping of the end element 1 between the lugs 41, 42 and the guiding blocks 44, 45 depending upon  
5 the wearing of on one hand the surfaces 46, 47 and guiding pins 22, 23 and on the other hand the holes 43 in the lugs 41, 42 and the tapered pins 21, the parts of the guiding blocks 44, 45 provided with the surfaces 46, 47 can be fastened by the aid of screws whereby it is easy to alter the position of  
10 the guiding surfaces 46, 47 by insertion of shims.

In order to disconnect the quick-attachment in accordance with the invention the driver only needs to actuate the hydraulic cylinder 27 or corresponding mechanism so that the locking  
15 head 28 is withdrawn from the opening 49 in the locking block 48. Then, the clamping action immediately ceases and all the driver has to do is only to operate the arm 4 so that the tapered pins 21 are withdrawn from the holes 43 in the lugs 41, 42.

20

In Fig. 6 there is shown an alternative embodiment of the quick-attachment in accordance with the invention. This one includes as well as the previously described embodiment an end  
element 1a which is secured to the end of an excavator beam 4a  
25 and to a rod 5a from a hydraulic cylinder 6a for operating the digging bucket 3a connected to the beam 4a, and a tool element 2a connected to the digging bucket 3a.

The end element 1a differs from the end element 1 essentially  
30 by the fact that the guiding pins 22, 23 arranged parallel to the plate 10 are substituted by pivotable guiding pins 50 which are pivotably mounted to the ends of the webs 11a and 12a. On the plate 40a mounted to the digging bucket 3a there are guiding blocks 44a, 45a the location and structure of  
35 which correspond to the ones of the guiding blocks 44, 45. The guiding blocks 44a, 45a are provided with sloping guiding

planes 46a, 47a which correspond to the guiding planes 46, 47 but they are complementary shaped to the pivotable guiding pins 50 and they are, accordingly, cup-shaped. Thereby is obtained not only the action that the pivotable guiding pins 50 are pressed aside for reaching the clamping action described in connection to the first embodiment of the invention but also a guiding sideways.

Both said embodiments of the quick-attachment in accordance with the invention are operating in corresponding way but while in the first embodiment the contact between the guiding pins 22, 23 and the guiding surfaces 46, 47 more is a line so in the latter embodiment there is obtained a larger surface for the contact between the pivotable guiding pins 50 and the guiding surfaces 46a, 47a and hence, a lower area load.

Depending upon the wearing the pivotable guiding pins 50 will slide longer and longer towards the plate 40a along the guiding planes 46a, 47a and then, if the pins 50 were not pivotable a matching between the pins and the guiding planes could not be obtainable. Further, the pivotability gives rise to some adaptation of the guiding pins to the sloping guiding planes for such tolerance variations which might appear.

In the embodiment in accordance with Figs. 1 to 5 the end element 1 is connected to the beam 4 and the rod 5 by the aid of particular shafts 13, 14 while in the embodiment in accordance with Figs. 6 the beam 4a is shown connected to the end element 1a by the aid of the same shaft as the one upon which the guiding members 19a, 20a are journalled. However, it is quite clear that the mounting of the beam 4, 4a and the rod 5, 5a to the end element 1, 1a can be carried out in different ways without affecting the basic inventive idea.

By the present invention the object referred to in the preamble has been reached. For a man skilled in the art it is

clear that the structure itself may be altered within the scope of the invention without deviating from the protection defined in the attached claims.

## CLAIMS

1. Quick-action attachment device for releasable mounting of a working tool (3, 3a) to the end of an operating arm (4, 4a) which device includes at least one lug (41, 42), at least one guiding block (44, 45, 44a, 45a) and at least one locking  
5 block (48) for permanent securing to the working tool (3, 3a), and one element (1, 1a) having at least one tapered pin (21) for receiving in the lug or lugs (41, 42) on the working tool (3, 3a), at least one guiding (22, 23, 50) for cooperation with the guiding block or blocks (44, 45, 44a, 45a), and at  
10 least one locking head (28) for engagement with the locking block or blocks (48), c h a r a c t e r i z e d by the fact that the tapered pin or pins (21) are pivotable in a plane normal to the plane in which the elements are mounted.
2. Device in accordance with claim 1, c h a r a c t e r i -  
15 z e d by the fact that the guiding or guidings (50) are pivotable in the same plane as the tapered pin or pins (21) and are receivable in complementary shaped guiding planes (46a, 47a) on the guiding blocks (44a, 45a).
3. Device in accordance with claim 1, c h a r a c t e r i -  
20 z e d by the fact that the guiding or guidings (22, 23) are constituted by rotatable pins which are pivotable along guiding planes (46, 47) on the guiding blocks (44, 45).

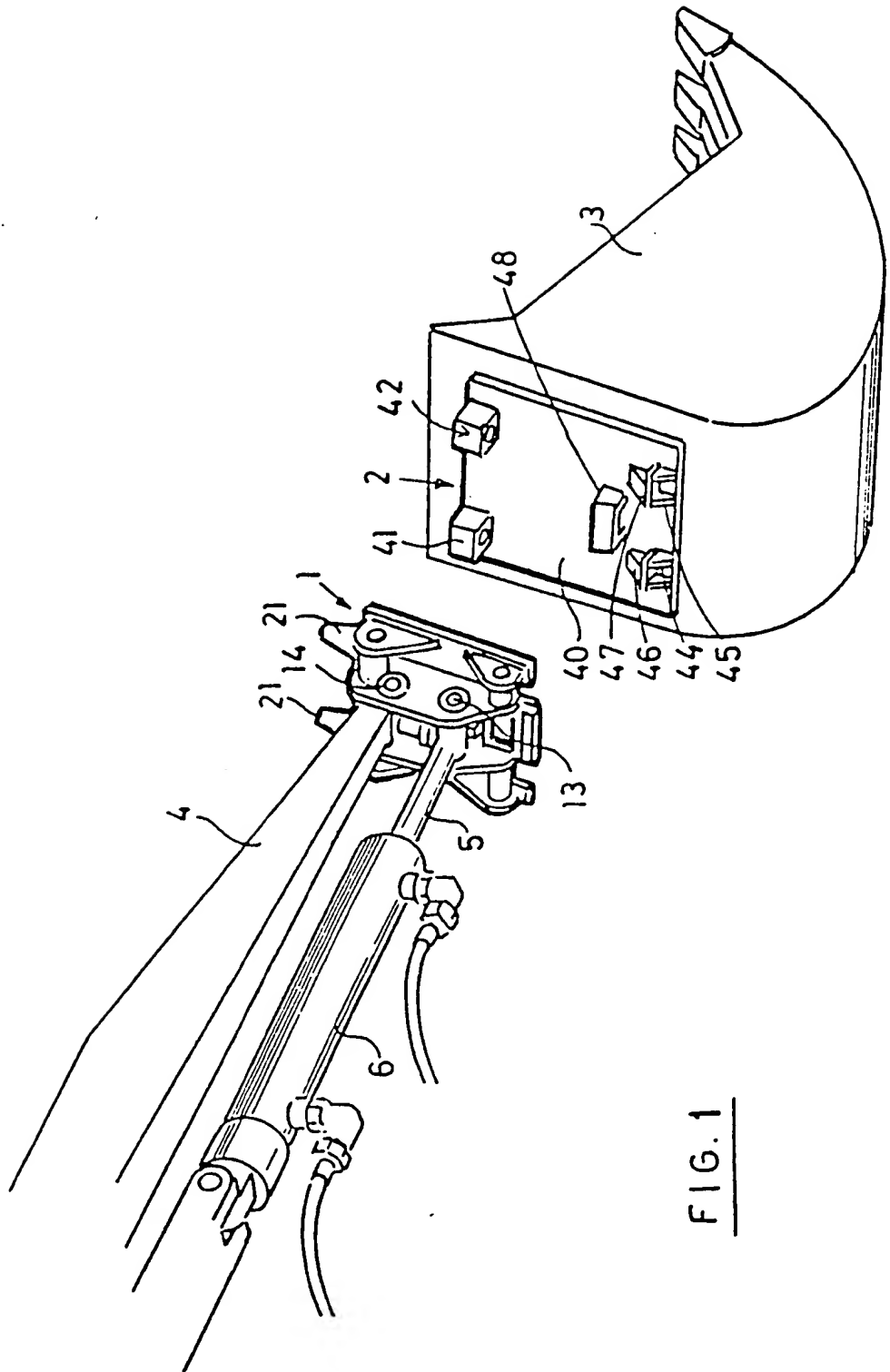


FIG. 1

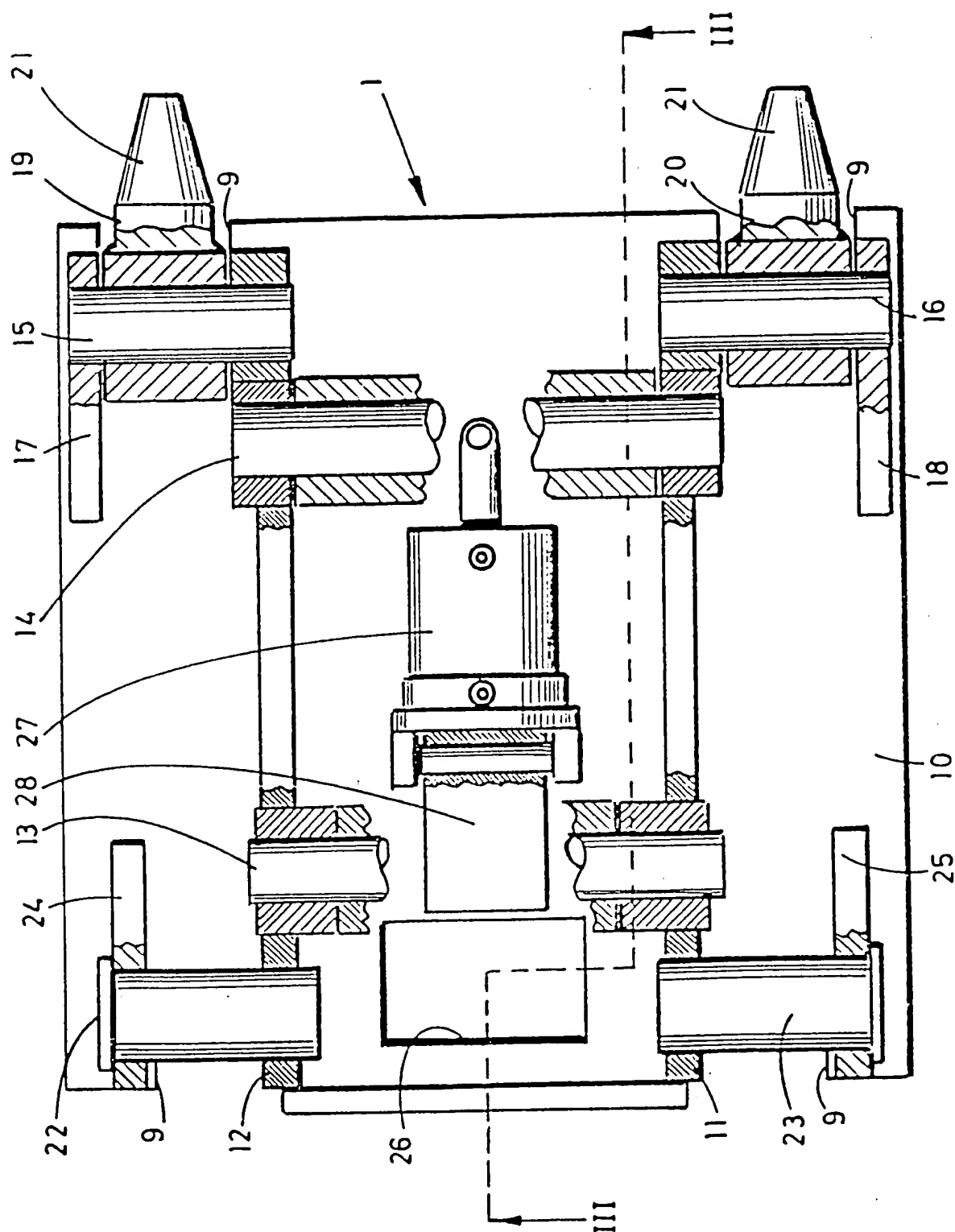


FIG. 2

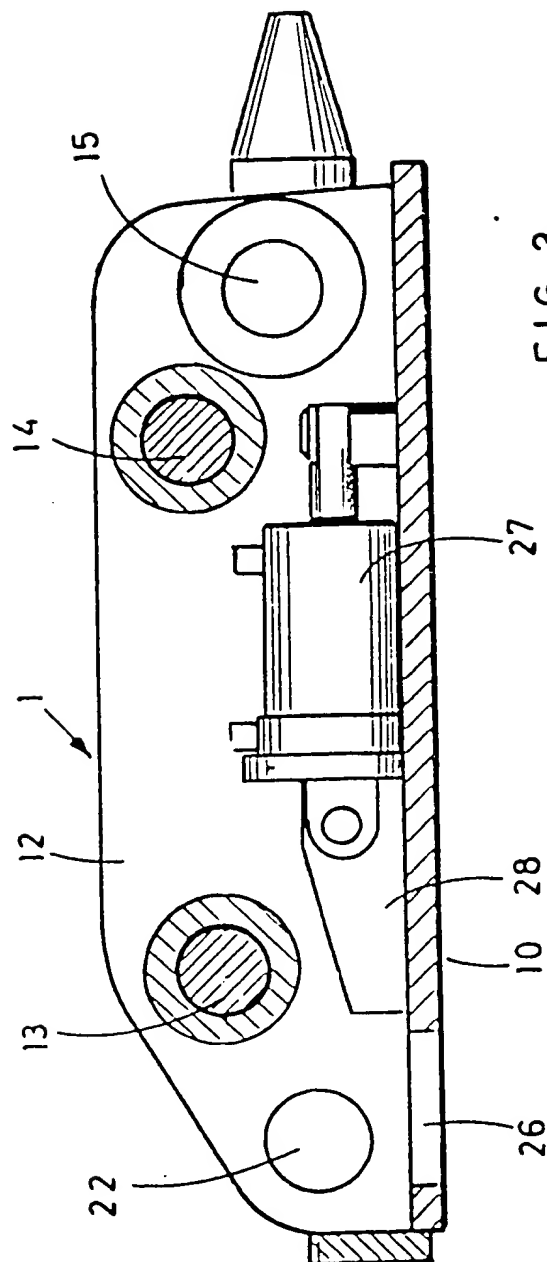
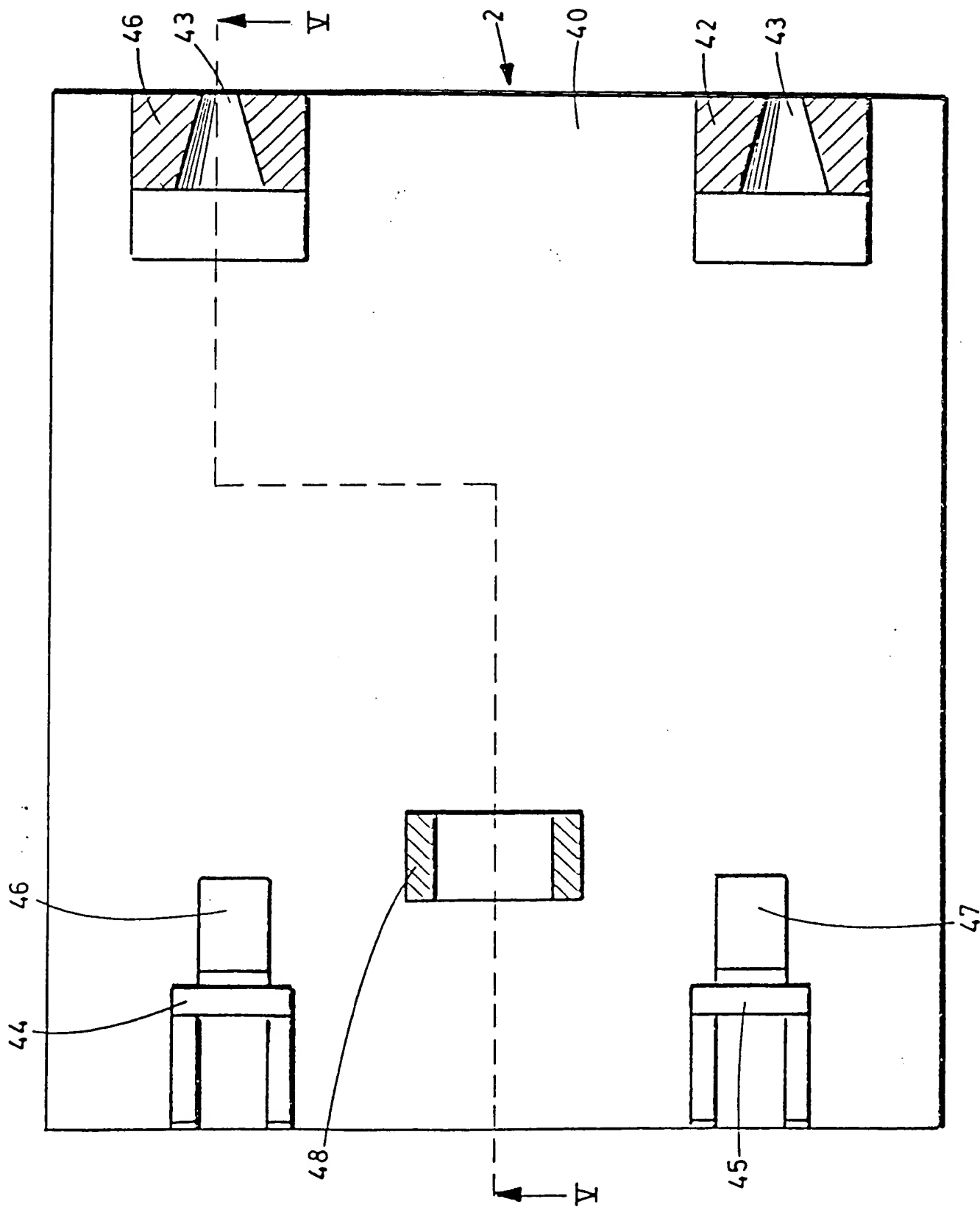
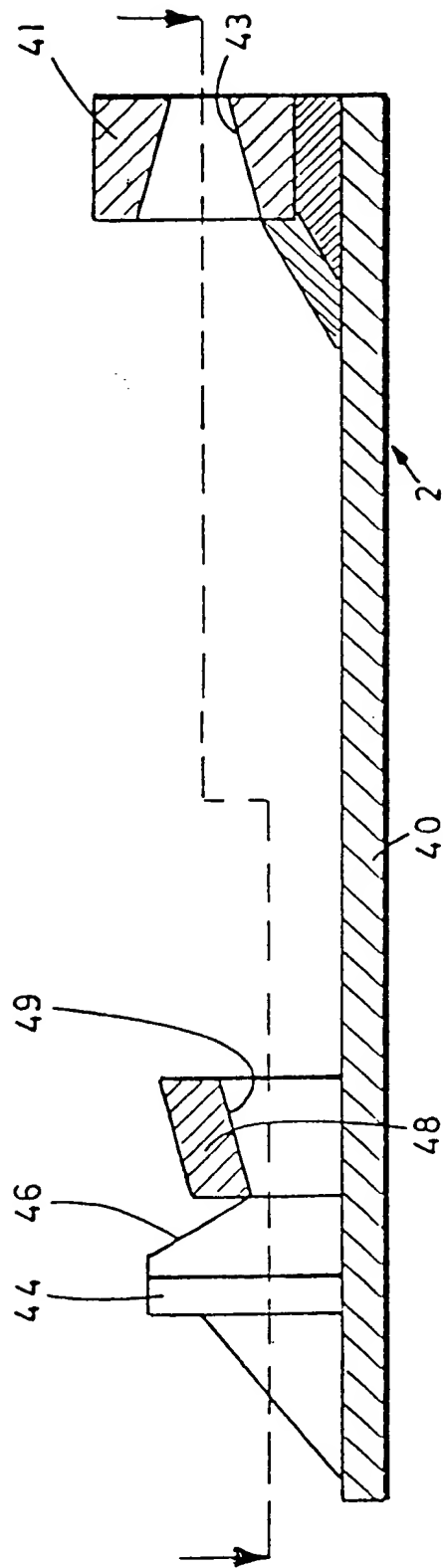




FIG. 4





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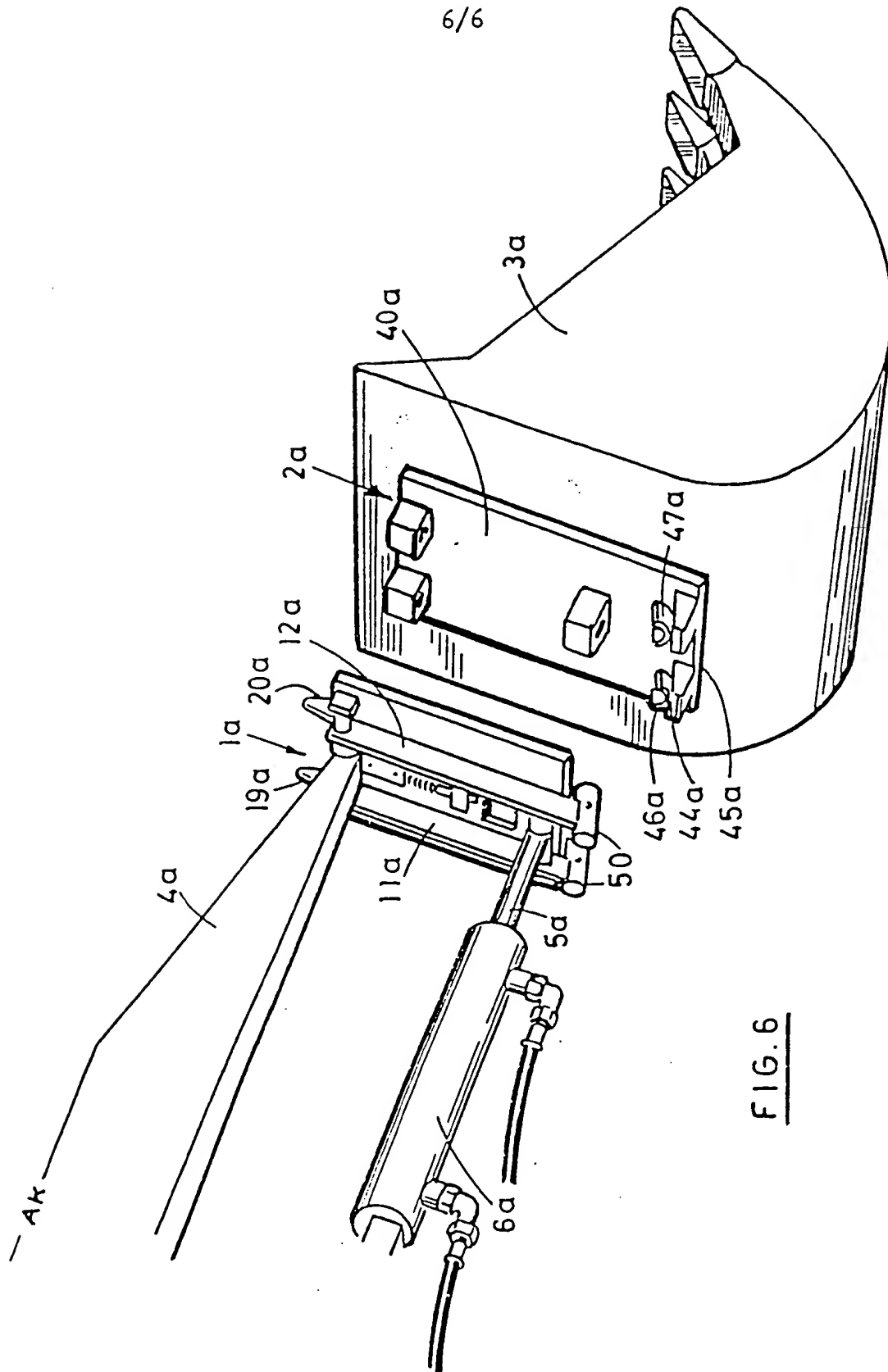


FIG. 6

# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE83/00125

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC 3		
E 02 F 3/96		
<b>II. FIELDS SEARCHED</b>		
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Classification System	Classification Symbols	
IPC 3 US C1	E 02 F 3/28-42, 96, 9/00 37:117.5, 118; 214:131, 145; 414:723	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
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<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> 1*		
Category *	Citation of Document, 1* with indication, where appropriate, of the relevant passages 1*	Relevant to Claim No. 1*
Y	SE, A , 8003255-0 (J K R GREN) 30 October 1981	1
Y	US, A , 3 876 092 (MAC DONALD) 8 April 1975	1
A	US, A, 4 043 470 (PILCH) 23 August 1977	
A	US, A, 4 085 856 (WESTENDORF) 25 April 1978	
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